L BAND INTERFACE SPECIFICATION

INTERIM SPECIFICATION

Submitted by:

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L Band ODU/IDU Interface Specification:

1. **Overview**: In order for an ***In Door Unit(IDU) also referred to as a modem*** and ***Out Door Unit(ODU) also referred to as a radio*** to operate as one seamless unit, yet be produced by different manufacturers, a pre-determined interface must be designed. This interface will allow the modem, which typically will have much greater computing ability, to manage, service, and supervise the external radio. This interface is intended to be a spectrum based except for the critical control and monitoring parameters that must be transferred between the modem and the radio to establish a reliable link. The intent of this L Band Specification is to suggest a framework that will lead to the inter-operation between different IDU and ODU vendors.

2. **Management**: The modem will be able to control all tunable features of the radio. In order to improve the robustness of any communication link, the system operator must be given the tools to control and examine the entire system. Currently, most network devices (routers, switches, cable modems, etc.) have the ability to respond and react to commands from the network manager via SNMP, *S*imple *N*etwork *M*anagement *P*rotocol. In a wireless data application, the radio equipment is typically not under management control. Furthermore, the radio does not have the processing power to run the TCP/IP protocol stack. This section describes the framework of how the system manager, via SNMP, can manage the radio equipment.

   The low-level radio parameters (frequency, power, etc.) will be controlled by a microprocessor on board the radio. These parameters will be communicated to and from the radio via a command[1] language over a serial bus. The modem will perform the translation between radio commands and SNMP messages. This will allow the modem to relay commands to the radio from the system manager or relay responses to the manager from the radio. In other words, the modem, which runs the TCP/IP protocol stack, will act as a translator between SNMP and the radio command language.

   All communication between the radio and the modem is intended to be bi-directional. All settings which are programmed should have the ability to be interrogated as well.

2.1. Transmitter

2.1.1. Frequency

The modem will have the ability to set the radio transmit translation frequency. The low-level drivers for the PLL synthesizers will reside on the microprocessor within the radio, ie. the modem will pass only the final TX local oscillator frequency, the radio µP will determine all loop divider coefficients.

2.1.2. Power

The transmit gain is set by sending the power setting in dB. The radio driver will translate the gain, in dB, into the appropriate device settings. Ideally, if the radio has multiple gain adjustment points, the radio driver should be optimized program the transmitter for best intermod/power performance. In addition a separate command to turn the transmitter on and off is to be provided.

[1] Refer to Section 7 for the command descriptions

2.1.3. Gain

The transmitter gain setting will typically be imbedded in the transmit power setting. This command is included for the benefit of the radio vendor to control the radio in a lab or repair environment

2.2. Receiver

2.2.1. Frequency

The receive translation frequency is programmed in similar fashion to the transmitter. The modem will relay the final RX local oscillator frequency and the radio will program the PLL synthesizers.

2.2.2. Gain

The receiver gain is set by sending the receiver gain in dB. As in the transmitter, if the receiver uses multiple variable gain/attenuator stages the radio should be optimized to set the gain for best noise/intermod performance.

Additionally, the receiver gain can be set on an individual stage basis. This ability is included for the benefit of the radio vendor to control the radio in a lab or repair environment

2.2.3. Sensitivity

In a point-to-multipoint application, the potential for the traditional near/far problem arises. If the receiver incorporates a switchable front-end to reduce the sensitivity and increase the intercept point, the radio will be able to switch in or out the first stage LNA.

3. **Service:** The modem will supply to the radio necessary signals

3.1. DC Supply:

The radio will receive DC power from a source separate from the modem DC supply. The radio vendor will supply the power appropriate for the installation. The DC will be supplied on the center conductor of the coax modem Tx cable.

3.2. PLL Reference: 10MHz

Every PLL requires a stable reference to phase-lock a VCO. By providing the reference from the modem, the reference can be derived from a central ultra-stable clock (i.e. GPS, LORAN, atomic clock) which can be propagated throughout the entire system. The VCO reference will be supplied on the modem TX cable.

4. **Supervision**: The modem will supervise the radio and determine if the radio has failed or if a failure is imminent.

4.1. Amplifier bias monitoring
4.2. VCO steering line monitoring
4.3. Temperature
4.4. Current draw

5. **Logical Interface**: The standard by which messages are transmitted between the IDU and the ODU will be serial interface based on the RS232 protocol.

6. **Physical Interface:** This section describes the physical connection between the IDU and ODU in terms of a N-West Compliant L-Band Interface. In order to maintain the maximum amount of flexibility, the transmit and receive signals are separated out onto individual cables using similar but isolated L-Band spectral interfaces. The intention is to shorten the design cycle for emerging technologies, however, any diplexing will need to occur at the modem. Table 1 lists the physical interface for an N-WEST compliant L-Band interface.

Table 1: N-West Physical Interface Characteristics

Receive (Downstream)	
Frequency	950-2150 MHz
Modulation	independent
Level	System Defined
Channel Bandwidth	N x 5 Mhz
Transmit (Upstream)	
Frequency	950-2150 MHz
Modulation	independent
Level	System Defined
Separate 75Ω TX/RX Cables With F-Connectors (Short Runs)	
In Line Linear Fiber Optic Converters can be Inserted (Long Runs)	

7.0 Radio/Modem commands

Overview: The radio command language is a text-based command set which enables the user to communicate with the radio via SNMP or a standard ASCII terminal. The structure for each command is based upon the syntax:

[SPCL] COMMAND [READ/SET] [ADDRESS] VALUE [CHECKSUM]

This implies that each command can program or interrogate every setting. Operations which are inherently read-only (i.e. A/D converters, alarm states) will only have interrogate methods.

Following is a list of commands which will be accessible to the system manager via SNMP (and the modem). This list represents only the commands useful to link management, the radio & modem vendors are encouraged to expand this command set to add features useful during test and commissioning.

The [SPCL] character is an optional character defined as:

- # Comment, useful to document a radio initialization script
- ! The ASCII checksum of each subsequent character is appended to the command

The CHECKSUM is calculated as the 8-bit rollover sum of the ASCII values of each character in the command string. The checksum in the hex representation of the sum: 0x00 – 0xFF. The checksum is calculated on every character between the '!' and the checksum.

Transceiver Configuration:

Transmit Translation Freq.: **txfreq** <read/set> ddddEee

- dddd is 4-digit integer frequency
- ee is two digit multiplier
- allowed values: 0000-9999 and 00-10
- units: Hertz

Transmitter ON or OFF: **txonof** <read/set> dd

- dd is 2-digit integer indicating TX state
- allowed values: 00 & 99 for Transmitter for on & off respectively

Transmit Power(Maximum): **txpwr** <read/set> dd

- dd is 2-digit integer TX power
- allowed values: 00-99
- units: dBm

Transmit Gain: **txgain** <read/set> <address> 0xHH

- address selects which attenuator or amplifier is adjusted
- 0xHH is 1-byte hex value
- allowed values: 0x00-0xff
- unitless

Receive Translation Freq: **rxfreq** <read/set> ddddEee

- dddd is 4-digit integer frequency
- ee is two digit multiplier
- allowed values: 0000-9999 and 00-10
- units: Hertz

Receive Gain: **rxgain** <read/set> dd

- dd is 2-digit integer RX gain
- allowed values: 00-99
- units: dB

Receive Sensitivity: **rxsen** <read/set> <high/low>

- high: LNA is active
- low: LNA is bypassed

Alarms[2]:

NOTE: All alarms are read only. All alarms may not be implemented.

LO Alarms: **loalarm** <address>

- address selects which LO alarm is reported
- returns: 1 if inactive, 0 if active (LO is out-of-lock)

Amplifier bias alarm: **biasalarm** <address>

- address selects which bias alarm is reported
- returns: 1 if inactive, 0 if active (bias is outside window)

Temperature: **temp** <address>

- address selects which temp monitor is reported
- returns: -99 to +99
- units: TBD

Current: **ampalarm** <address>

- reports radio current draw for main supply
- returns: 00-9999
- units: mA

A/D and D/A Converters

D/A Converters: **dac** <read/set> <address> 0xHH

- address selects D/A
- method is read/write
- 0xHH is 1-byte hex value
- unitless

A/D Converters: **adc** <address>

- address selects which A/D is read
- returns: 0x00-0xFF
- unitless

[2] All alarms should be active low